in the secondary schools, without any specialisation whatever. "We in Germany do not care to know anything about a river unless it will float a ship, and new countries interest us only when they afford an outlet for our industry." Speaking afterwards upon the past and present of commercial education in Germany, Dr. Stegemann pointed out the solidarity which existed between the professors of their schools and the commercial men of the country, a union which led to the happiest results, inasmuch as the latter had given to the former the benefit of their practical business experience. In conclusion, he said that he ventured to counsel English educationists not to lose sight of the fact that, even in Great Britain, they must give to their young men a more extended and practical course of study if they wished to maintain the commercial prestige of their country. As to the aim of the continental higher commercial institutes, M. Heinzmann Savigno (Antwerp) said the object pursued at the Antwerp Institute, and at the other establishments modelled upon it, was not to furnish "clerks" in the ordinary acceptation of the word, but "merchants," who would be able to transact their business on a scientific basis, and give to their commercial transactions an impetus which would materially extend their country's home and foreign trade. They also aimed at the creation of men who would be properly prepared to be themselves professors of the higher commercial sciences, or to go forth into the world and effectively undertake the duties of the consular service. The speaker added that, in order to keep pace with the growing extension of colonial enterprise, he would strongly advocate the formation of a special class of men competent by their knowledge to take the lead in colonial development.

SCIENTIFIC SERIALS.

American Journal of Science, May.—On the properties of seasoned magnets of self-hardening steel, by B. O. Peirce. In searching for a material of which to make a set of standard measuring magnets which should be as permanent as possible and have small temperature and induction coefficients, the author tested a number of magnets made of some of the brands of "self-hardening" tool steel now in common use for lathe tools. He found that the temperature coefficient could be reduced almost indefinitely by cutting the rods long and thin.—Some lava flows of California, by F. L. Ransome. This paper deals with a strip of the middle, western slope of the Sierra Nevada. The volcanic eruptions began during the Miocene period and continued to the end of the Pliocene. The deposition of auriferous gravels both preceded and accompanied the deposition of volcanic material. The author distinguishes three separate flows of lava, which were eventually brought to an end by fresh andesitic eruptions. During Pleistocene time the present streams have dissected the Neocene lavas and tuffs, and have deeply cut into the Jurassic and older rocks.—Some new Jurassic vertebrates from Wyoming, by W. C. Knight. The University of Wyoming has in its collection of Jurassic vertebrates partial remains of four swimming saurians that in a general way resemble Plesiosaurs. The discovery of these remains is of considerable value to American Mesozoic geologists for correlating the American and European Jurassic. The largest of the four species surpasses in size the European Pliosaur, and it is described under a new genus, *Megalneusaurus*. The description given is founded upon a cervical, dorsal, and caudal vertebra; one fore-limb nearly complete; ribs, and the greater portion of the pectoral girdle. The genus represents the largest known animals of the order Sauropterygia.—On the estimation of manganese separated as the carbonate, by Martha Austin. The carbonate precipitated by means of alkaline carbonates is very uncertain. An improvement in the quantitative analysis may be effected by converting the carbonate first into oxide and then into sulphate by heating with a few drops of concentrated sulphuric acid.

Symons's Monthly Meteorological Magazine, May.—The climate of Algeria, by Dr. A. Thevenet, director of the Algerian Meteorological Service. The first subject dealt with is temperature. The absolute maximum in the shade is 122° at Orléansville (lat. 36° 40′ N., long. 1° 19′ E.), and the absolute minimum is given as 6°·8, at El-Aricha (lat. 34° 16′ N., long. 1° 23′ W., altitude 4364 feet). Sharp frost is not infrequent on the Sahara, but on the Mediterranean coast frost is rare. The air is not so dry as might have been expected; monthly means below 40 per cent. are very rare, except on the high plateaux and on the Sahara. The mean annual rainfall at Algiers, as recorded at four stations between 1838 and 1895, is 30·16 inches, but there is considerable divergence between the different records.—Results of meteorological observations at Camden Square (London) for April for forty years, 1858–97. The mean of all the highest maximum temperatures was 70°·7, and the mean of all the lowest minima was 29°·8. The average monthly rainfall was 1·66 inches, while in April of this year it was only 1·01 inches.—The gloomy summers of 1860 and 1879, and the nineteen years' cycle, by H. A. Boys. The author points out that there has been so obvious a parallel between most of the last few years and those years that preceded them by 19 and 38 years respectively, that ground has been given for watching whether the summer of 1898 will not prove gloomy and rainy like those of 1860 and 1879, at least in the midland counties.

Wiedemann's Annalen der Physik und Chemie, No. 4.—Some modifications in the quadrant electrometer, by J. Elster and H. Geitel. The drying apparatus is a wide side tube off the chamber containing the quadrants. It contains a wire attached to the movable end cover, and the point of the wire carries a piece of sodium, wiped or scraped to remove adhering petroleum or oxide. Below the sodium is a glass bulb, which catches the dripping moisture. The sodium is surrounded by a wire net to prevent its dropping bodily into the liquid.—Duration of electric oscillations of large periods, by J. Bergmann. Describes an improved apparatus for measuring oscillations with periods over one-millionth of a second.—Fluorescence and actino-electricity, by G. C. Schmidt. E. Wiedemann and the author have propounded the theory that the molecules, split up into ions by the action of light, give rise to fluorescence on recombination. This would lead to the conclusion that fluorescent bodies could not easily lose negative ions on exposure to light, *i.e.* would not be photo-electrically or "actino-electrically" sensitive. This conclusion is, however, not borne out by experiment, as no connection between the two phenomena can be established. It is found, on the other hand, that bodies which exhibit the strongest thermo-luminescence show also the strongest photo-electric action.—A new method of measuring dip and horizontal intensity, by G. Meyer. The dip may be measured without a magnet and without a galvanometer by means of a continually revolving inductor coil and a telephone. The axis of the coil is adjusted to the telephone minimum. The measurements are correct to within 3′ of arc. To measure the horizontal intensity, the earth's field is compensated by the field due to a current of known strength. Complete compensation is indicated by silence in the telephone.—An instrument for measuring astigmatism, by R. Straubel. This consists of two cylindrical lenses which rotate with respect to each other about a common axis. Artificial astigmatisn of any given amount may thus be produced.

FROM the articles in the *Journal of Botany* for March–May, we may select the following as of the most general interest:—The fifty years' limit in nomenclature, by the editor; in which he shows how impossible it would be to work such a rule in practice. Notes on Mycetozoa; and Mycetozoa of Antigua and Dominica, by Mr. A. Lister. Experiments in cross-fertilisation of *Salices*, by Mr. G. F. Linton. Some species of willow cross with great readiness, others with reluctance, and others obstinately resist all attempts at hybridisation. Wayfaring notes in Rhodesia, by Mr. R. F. Rand. The work of cross-fertilisation of the native flowers of Rhodesia appears to be effected largely by butterflies; but by far the most active agents are beetles.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, May 5—"On certain Structures formed in the drying of a Fluid with Particles in Suspension." By Catherine A. Raisin, B.Sc. Communicated by Prof. T. G. Bonney, D.Sc., LL.D., F.R.S.

Experiments have been made with various muddy fluids, which were allowed to dry under certain conditions, in order to study the forms assumed by the dried material. It seemed possible that these forms might throw some light on the origin of certain minor structures in rocks. Various pigments or powdered rocks (mostly very fine grained) were mixed with water and placed on microscope slides or larger pieces of glass, generally beneath a cover-glass.

In materials not of the very finest grain (*e.g.* prussian blue), the forms shown by the dried powder consist usually of two sets of elements, coarser and finer. The former tend to develop as branching stems, which are either bent and winding, forming a kind of maze, or somewhat rectilinear with terminal knobs. The finer material forms a feathery or fan-shaped pattern, generally at the margin of the deposit, and in the intervals between the coarser stems. It consists of successive curving lines, or of radial streaks and furrows. The different structures are combined in various patterns, of which one illustration is reproduced (Fig. 1). In addition, vesicular structures, cracks, and joints are developed in the dried mud, some of the cracks bearing even a certain resemblance to the appearance in frozen gelatin described by Prof. Sollas (*Trans. Roy. Ir. Acad.*, 1890). The mode of formation was studied by watching the films in the process of drying, and by comparing different examples. As the edge of the film gradually retreats, coarser stems begin to form, while fine material, remaining for a time in moist condition, afterwards dries as the fine pattern.

These various forms seem to illustrate, more or less closely, structures which occur in nature. Thus, dendritic deposits along joint-planes, or on other surfaces in rocks, although undoubtedly they often are the effects of crystallisation, may be sometimes formed by mechanical drying, or both conditions may co-operate. It is possible that some of the "pseudorganic" structures described in rocks, might really be the casts or replacements of dried streaks. Similar principles to those shown in these films may govern the formation of structures in the mass of a rock, as, for example, the development of Landscape Marble (as explained by Mr. B. Thompson), or the growth of some agates and chalcedonic deposits. Even the solidification of certain igneous rocks, or the processes of secondary silicification, may be somewhat analogous. Further, the similarity shown in cracks and vesicles to those in some pyromerides seems to give support to the hypothesis that these nodules at an early stage were often in a semi-solidified condition with an external crust.

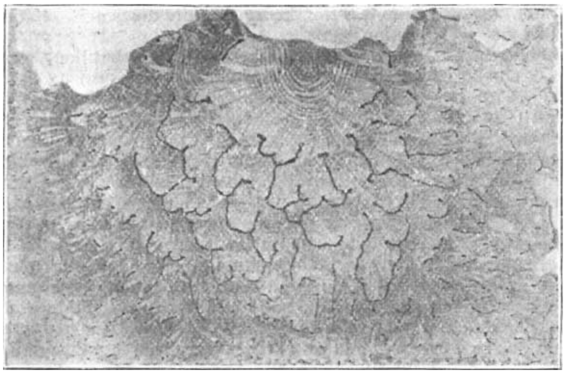

FIG. 1.—This shows near one edge a fine pattern with concentric lines and radial furrows; then coarser bent stems, which become smaller and reduced towards the further margin, while the fine material forms rather feathery tufts. Prussian blue. (Natural size.)

In conclusion, the forms resulting from the processes of crystallisation, which have been described in numerous papers by different authors, may be shortly compared; and some additional experiments have been made, especially as to the effects produced by the admixture of material in suspension (or of a colloid) with the solution of a crystallising salt. Spherulitic and dendritic forms, as described by Lehmann and other observers, may be developed, or even an imitation of micropegmatitic structure. Certain interesting forms of ice crystals (shortly described in NATURE, 1892, by Prof. Meldola, Prof. Bonney, and others) are shown, in a note by Prof. Bonney, to have been developed under somewhat similar conditions.

"The Relations between the Hybrid and Parent Forms of Echinoid Larvæ." By H. M. Vernon, M.A., M.B. Communicated by Prof. Ray Lankester, F.R.S.

The object of this research was to determine systematically, during a period of several months' duration, the exact relationships of structure and size existing between certain hybrid and parent Echinoid larval forms. The method of procedure was similar to that described in a former paper (*Phil. Trans.* B., 1895, p. 577).

Upon the cross *Sphærechinus* ♀ -*Strongylocentrotus* ♂, twenty-two experiments were made. As a rule only 10 per cent. of the ova were fertilised, and only 1 per cent. of them reached the eight days pluteus stage. The hybrids were most easily obtained in the summer months, few or none of the ova being cross-fertilised in the winter. The hybrids obtained in May, June, and July were of an almost pure *Sphærechinus* type, only a third or less of them being of an intermediate or *Strongylocentrotus* type. In November, on the other hand, only about a sixth were of the maternal, and five-sixths of a semi-paternal type. Finally, in December and January all the hybrid larvæ were of this paternal type.

On the reciprocal cross of *Strongylocentrotus* ♀ and *Sphærechinus* ♂ eighteen experiments were made. During April, May, and June a fair number of the ova were cross-fertilised, but no plutei were obtained. In July and August some 47 per cent. of the ova were fertilised, and 29 per cent. of them survived to the eight days' pluteus stage. In November and December, on the other hand, not only were no plutei obtained, but as a rule not a single ovum was cross-fertilised. The hybrid larvæ themselves were of the pure *Strongylocentrotus* type.

These extraordinary variations in the capacity for cross-fertilisation seem to be due to the variations in maturity which the sexual products undergo with change of season. Thus in July and August most of the *Strongylocentrotus* individuals contain but very small quantities of ripe sexual products, or none at all; and the larvæ obtained may be as much as 30 per cent. smaller than those obtained in the winter and spring. At intermediate times of the year the larvæ are of intermediate size. It appears, therefore, that the *Strongylocentrotus* ♀ -*Sphærechinus* ♂ hybrid is only formed at the time when the *Strongylocentrotus* ova have reached their minimum of maturity; whilst in the case of the reciprocal hybrid, it follows that as the maturity of the *Strongylocentrotus* sperm increases, it is able to transform first a portion and then the whole of the hybrid larvæ from the *Sphærechinus* to its own type. In other words, the characteristics of the hybrid offspring depend directly on the relative degrees of maturity of the sexual products.

As a result of the ten experiments made on the cross *Echinus* ♀ -*Strongylocentrotus* ♂, it was found that the hybrid larvæ were on an average about 8 per cent. *larger* than the pure parental larval forms, and, moreover, that even more of the cross-fertilised ova developed to plutei than of the directly fertilised ones. In the reciprocal cross, only about 1 per cent. of the ova reached the pluteus stage, and these plutei were about 13 per cent. smaller than the pure maternal larvæ.

Various crosses, in several instances reciprocal ones, were also effected between *Strongylocentrotus*, *Sphærechinus*, *Echinus microtuberculatus*, *Echinus acutus*, *Arbacia*, *Echinocardium cordatum*, *Echinocardium mediterraneum* and *Dorocidaris*.

On performing cross-fertilisations with the colour varieties of *Sphærechinus*, there was found to be a distinct diminution of fertility. Series of experiments were made in June, July, November and December, the differential fertility seeming to gradually diminish with the progress of the season. Nevertheless, it was always most distinctly present. There was little or no infertility between the less definitely marked colour varieties of *Strongylocentrotus*.

April 28.—"A Compensated Interference Dilatometer." By A. E. Tutton, Assoc. R.C.S. Communicated by Captain Abney, C.B., F.R.S.

The author describes a form of Fizeau interference dilatometer which he considers combines the best features of the apparatus described by Benoit, and belonging to the Bureau International des Poids et Mesures, in Paris, and that described by Pulfrich, constructed according to the modifications introduced into the method by Abbe. Moreover, besides other improvements, a new principle, that of compensation for the expansion of the screws of the Fizeau tripod which supports the object, is introduced, which enhances the sensitiveness of the method so highly as to render it applicable to the determination of the expansion of crystals in general, including those of chemical preparations. Hitherto the application of the Fizeau method has been confined to such crystals as could be obtained large enough to furnish a homogeneous block at least a centimetre thick. A block only 5 mm. thick is ample for use with the author's compensated dilatometer. The principle of the compensation depends upon the fact that aluminium expands 2·6 times as much as platinum-iridium for the same increment of temperature. The author therefore employs, like Fizeau and Benoit, a tripod of platinum-iridium, and places upon its transverse table, through which pass the three screws, a disc of aluminium whose thickness is 1/2·6ths of the length of the screws. The space between the lower surface of the glass plate which is laid upon the upper ends of the screws to assist in producing the interference, and the upper surface of the aluminium, then remains constant for all temperatures under observation, and if a crystal is laid upon the aluminium compensator the whole amount of its expansion by rise of temperature is available for measurement by the interference method. Hence the method is no longer a merely relative one, affording the difference of expansion between the tripod and the substance investigated, but affords directly absolute measurements of the expansion.

The results of numerous determinations of the expansion of the platinum-iridium of the tripod are given, carried out with the surface of the tripod table and the cover-wedge separated at the long interval of 12 mm., by the aid of green mercury light. The mean value is very similar to that of Benoit, and is

$$\alpha = 10^{-9}(8600 + 4{\cdot}56t).$$

The result of several determinations in red hydrogen light of the expansion of the pure aluminium used for the series of compensators, carried out by the Fizeau relative method with a block 12 mm. thick, is

$$\alpha = 10^{-8}(2204 + 2{\cdot}12t).$$

Similar determinations for the black glass of the crystal-covering plates afford the value:

$$\alpha = 10^{-9}(7257 + 10{\cdot}4t).$$

In a subsequent memoir the author intends to present the results of determinations of the expansion of the sulphates and selenates of potassium, rubidium, and cæsium.

Physical Society, May 27.—Mr. Shelford Bidwell, President, in the chair.—A paper by Messrs. Edwin Edser and C. P. Butler, on a simple method of reducing prismatic spectra, was read by Mr. Edser. The production of interference-bands in a continuous spectrum is capable of furnishing a reference-spectrum, which can be employed to determine the wave-lengths corresponding to the bright lines in a spectrum of a metal or of a gas. The authors discuss various methods by which such bands can be formed. In their final experiments, an air-film between two plane parallel glass plates is inserted in front of the slit of the spectrometer, in the path of the incident light. Owing to the interference of the direct ray with that twice internally reflected, bright bands separated by dark intervals are observed in the spectrum; these bright bands correspond to a series of different waves, whose lengths are easily determined for the whole series, when two of them are known. The bands are much improved by partial silvering of the two internal surfaces of the glass. It has been found that ordinary plate-glass, if well chosen, is good enough for all these experiments. In order to adjust for parallelism, a spot of light, or the filament of a glow-lamp, is viewed through the silvered surfaces. A long train of images is generally visible; these must be brought into coincidence. If now a sodium flame is looked at through the film, interference bands are seen. These bands must be adjusted by pressure, to be as broad as possible. An arc-lamp is used for illuminating the collimator slit. The authors exhibited the apparatus, and showed photographs of spectra-scales with the appropriate wave-lengths, calibrated upon them by this method. The results there obtained were read from the spectrometer to 0·4 of a tenth-metre, with an ordinary pocket-lens. A simple graphic method enables wave-lengths, corresponding to a great number of spectral lines, easily to be determined by inspection. The phase-changes introduced by the silver do not affect the final result. Prof. Threlfall congratulated the authors on their discovery of a method that would greatly reduce the labour of calibrating spectra, and at the same time give such accurate results. Prof. Boys said the simplicity of the apparatus added greatly to the value of the method. It would seem to him better if the slit were somehow contrived within the film-space. All want of definition due to rays falling at different angles upon the collimator object-glass would thus be avoided, and only a small part of the glass plates, *i.e.* the slit, would require to be strictly parallel planes. The limit of accuracy in the authors' method depended upon the collimator, not upon the optical perfection of the silvering of the plates. Mr. Butler pointed out that previous methods had always required experienced spectroscopists for mapping-out results. In the new method that work could easily be done by an assistant. Mr. Edser said that by putting the two plates immediately in front of the slit only a very small part of the glass is concerned in the action, light coming through at an angle would not reach the lens in the collimator.—Prof. Boys, Vice-President, then took the chair, and Mr. Campbell Swinton read a paper on some further experiments on the circulation of the residual gaseous matter in Crookes' tubes. In the discussion that followed the former paper on this subject, at the Physical Society on March 25, 1898, Mr. Appleyard had suggested that, in tracing the cause of the rotation of the exploring mill, it would lead to simpler results if the vanes were made of some light conducting substance, for it was probable that mica introduced complications by retaining the charges. Prof. Boys then pointed out that the mica might be gilded. Such a tube has now been made by Mr. Wolff. With the gilded mica vanes so placed as to be outside the kathode stream, the mill behaves in a manner similar to the non-conducting insulated mill. It shows a greater tendency to assume a position of stability, due to electrostatic induction; this renders it somewhat troublesome in starting, but, when once under way, the mill rotates always when excited. Occasionally, when starting, a few reverse revolutions are observed; these are probably due to electrostatic influence and momentum, and also possibly to eddy currents in the residual gaseous matter. But it is found, in all cases, that rotation in the direction that indicates a stream of residual gaseous matter from anode to kathode, follows the reversal immediately after one or two oscillations. An electrometer connected to the mill through the pivot and needle-point, shows the vanes to be always electrified positively. The results are confirmed by a second tube with oblique vanes. The author concludes that at very high exhaustions there exists a molecular or atomic stream from anode to kathode, which carries a positive charge, and travels at high velocity outside the opposite kathode stream. Mr. J. Quick asked what was the minimum degree of exhaustion required to produce these results. Prof. Boys said that the experiment gave some amount of probability to the truth of Mr. Campbell Swinton's hypothesis, but it did not altogether prove the mechanical theory of rotation to be correct. He was glad that the chance suggestion at the last discussion had led to such interesting experiments being continued. Prof. Threlfall mentioned that Boettger had devised a method for gilding mica, by a chemical process, that was much to be preferred to ordinary gilding. Mr. Campbell Swinton said it was necessary to exhaust the tubes as completely as possible to a point where it was only just possible for any discharge at all to pass through them. If the rotation was due to electrification, there must still be some mechanical process whereby the charges get to the vanes—a stream of residual gas satisfied that condition.—The Vice-President proposed votes of thanks, and the meeting adjourned until June 10.

PARIS.

Academy of Sciences, May 23.—M. Wolf in the chair.—Notice on the late M. Souillart, Correspondant in the Section of Astronomy, by M. O. Callandreau.—Some remarks on the periods of double integrals, and on cycles of two dimensions in algebraic surfaces, by M. Émile Picard.—New researches on the reaction between pyrogallol and oxygen in presence of alkalies, by M. Berthelot. The reaction depends upon the nature of the alkali employed. The amounts of oxygen absorbed, and carbon monoxide evolved, were measured and the oxidation products studied.—Chronophotography applied to the study of muscular action in locomotion, by M. Marey. The paper is accompanied by four plates, illustrating the methods used. After a set of photographs of the living animal has been obtained, its skeleton is prepared, and these photographed upon the same scale. From these the curves of change of length of each muscle can be deduced.—The origin of the vertebrates, by M. Edmond Perrier.—On minimum surfaces, by M. C. Guichard.—On systems of differential equations which satisfy quadruply periodic functions of the second species, by M. Martin Krause.—On the determination of the terminal curves of spirals, by MM. C. E. Guillaume and J. Pettavel. A mechanical method for determining Phillips' curve for spiral balance springs.—On a new method of determining the mechanical equivalent of heat, by MM. J. B. Baille and C. Féry. A cylinder of copper is fixed in a rotating magnetic field, and the heating effect measured. The moment of the couple required to keep the sphere at rest and the velocity of the field can be exactly measured. The correction for cooling must be measured with great exactness. In the preliminary results quoted the values of J lie between 422 and 426.—On some experiments in submarine acoustic telegraphy with the aid of a microphone, by M. E. Hardy.—On the osmosis of liquids through a membrane of vulcanised rubber, by M. G. Flusin. Since the measurement of the limiting osmotic pressure could not be carried out with this membrane, the velocity of the osmotic current was determined from the liquid into ethyl alcohol. The amounts of liquid absorbed by the rubber were also determined, but these figures are not proportional to the velocities of osmosis.—Improvement of over-exposed negatives, by M. Mercier. The plate is immersed for two minutes in a solution of tartar emetic, dried and developed as usual with hydroquinone.—On an apparatus for aërating boiled or distilled water, by M. Maillet.—Recapitulation of the atomic weights calculated by the method of limited densities, by M. Daniel Berthelot. By the methods given in preceding notes the atomic weights of carbon, sulphur, nitrogen, and chlorine are calculated. The agreement between the numbers so obtained, and those obtained by chemical methods is so close that the original assumption may be regarded as proved, Avogadro's law being strictly true only at extremely small pressures.—On the determination of the molecular weights of gases; reply of M. Marqfoy to M. Daniel Berthelot.—On reaction zones, by M. Albert Colson.—On the phosphorescent mixtures formed by strontium sulphide, by M. J. R. Mourelo.—On the limits of inflammability of combustible vapours, by MM. H. Le Chatelier and O. Boudouard.—Spectrum analysis of some non-conducting minerals by fused salts, by M. A. de Gramont.—Synthesis of safranine, by M. Georges F. Jaubert.—Action of aluminium chloride and of chlorine in presence of aluminium chloride upon anhydrous chloral, by M. A. Mouneyrat. By the action of $AlCl_3$ upon chloral at 100°, besides the products already discovered by Combes, pentachlorethane, $CCl_3.CHCl_2$ is obtained, and the tetrachlorethylene which forms the main product of the reaction is formed from this by further heating with $AlCl_3$. With chlorine, under similar conditions, a good yield of hexachlorethane is obtained.—Estimation of phosphoric acid in superphosphates, by M. Léo Vignon.—New observations on *Peripatus*, by M. E. L. Bouvier.—On the carbon monoxide normally contained in the blood, by M. Maurice Nicloux. The amounts of gas given by the blood of animals from the country is sensibly the same as in that of animals in towns (Paris). The carbon monoxide would appear to be produced within the organism itself.—On fungi intermediate between *Tricophytons* and *Achorions*, by M. E. Bodin.—On the minerals of the basaltic fumerolles of Royat (Puy-de-Dôme), by MM. A. Lacroix and P. Gautier.—On the apatite from certain granulitic enclosures from Chuquet-Genestoux, by MM. A. Gonnard and Adelphe.—Urinary acidity and its determination, by M. Charles Lapierre.—Earthquake of May 6, 1898, communicated by M. Michel Lévy.

DIARY OF SOCIETIES.

THURSDAY, June 2.

Royal Institution, at 3.—Modern Methods and their Achievements in Bacteriology: Dr. E. E. Klein.

Linnean Society, at 8.—Notes on some Lories: Prof. St. George Mivart, F.R.S.—A Revision of the Genus Symblepharis: E. J. Salmon.—On the Food of the Uropoda: Surgeon-Captain H. A. Cummins.

Chemical Society, at 8.—The Action of Ether on Organic Acids and on Carbohydrates in Presence of Hydrogen Bromide: H. J. H. Fenton and Mildred Gostling.

FRIDAY, June 3.

Royal Institution, at 9.—The Development of the Tomb in Egypt: Prof. W. M. Flinders Petrie.

Geologists' Association, at 8.—Fossil Sharks and Skates, with special reference to those of the Eocene Period: A. Smith Woodward.

SATURDAY, June 4.

Royal Institution, at 3.—The Temples and Ritual of Asklepios at Epidaurus and Athens: Dr. R. Caton.

MONDAY, June 6.

Royal Geographical Society, at 8.30.—Circumnavigation of Lake Bangweulu: Poulett Weatherley.

Society of Chemical Industry, at 8.—The Conditions existing in Acetylene Generators: Prof. V. B. Lewes.

Institute of Actuaries, at 5.—Annual General Meeting.

TUESDAY, June 7.

Zoological Society, at 8.30.—On some Crustaceans from the South Pacific. Part II. *Macrura anomala*: L. A. Borradaile.—Report on the Gephyrea collected by Mr. J. Stanley Gardiner at Rotuma and Funafuti: Arthur E. Shipley.—Fourth Report on Additions to the Batrachian Collection in the Natural History Museum: G. A. Boulenger, F.R.S.

WEDNESDAY, June 8.

Geological Society, at 8.—On the Discovery of Natural Gas in East Sussex: C. Dawson.—Note on Natural Gas at Heathfield Station (Sussex): Dr. J. T. Hewitt.—On some High-Level Gravels in Berkshire and Oxfordshire: O. A. Shrubsole.—The *Globigerina*-Marls of Barbados: G. F. Franks and Prof. J. B. Harrison. With an Appendix on the Foraminifera, by F. Chapman.

THURSDAY, June 9.

Royal Society, at 4.30.—*Probable Papers*: Experiments on Aneroid Barometers at Kew Observatory and their Discussion: Dr. C. Chree, F.R.S.—The Nature of the Antagonism between Toxins and Anti-Toxins: Dr. C. J. Martin and Dr. T. Cherry.—Some Differences in the Behaviour of the Real Fluids from that of the Mathematical Perfect Fluid: A. Mallock.—On the Heat Dissipated by a Platinum Surface at High Temperatures: J. E. Petavel.

Royal Institution, at 3.—Modern Methods and their Achievements in Bacteriology: Dr. E. E. Klein.

Mathematical Society, at 8.—On the General Theory of Anharmonics: Prof. E. O. Lovett.—Point-Groups in a Plane, and their Effect in determining Algebraic Curves: F. S. Macaulay.—On a Regular Rectangular Configuration of Ten Lines: Prof. F. Morley.—On the Calculus of Equivalent Statements (eighth paper): H. MacColl.

FRIDAY, June 10.

Royal Institution, at 9.—Some Experiments with the Telephone: Lord Rayleigh.

Royal Astronomical Society, at 8.

Malacological Society, at 8.

SATURDAY, June 11.

Royal Institution, at 3.—The Temples and Ritual of Asklepios at Epidaurus and Athens: Dr. R. Caton.

Geologists' Association (Waterloo Station, S.W.R.), at 1 50.—Excursion to Godalming. Director: T. Leighton.

BOOKS, PAMPHLET, and SERIALS RECEIVED.

Books.—City and Guilds of London Institute. Report of the Governors, March 1898 (Gresham College).—A Text-Book of Entomology: Prof. A. S. Packard (Macmillan).—Britain's Naval Power: H. Williams, Part 2 (Macmillan).—The Pruning Book: L. H. Bailey (Macmillan).—A Primer of Psychology: E. B. Titchener (Macmillan).—Weather Lore: R. Inwards, 3rd edition (E. Stock).—Ackworth Birds: Major W. B. Arundel (Gurney).—Elementary Practical Zoology: F. E. Beddard (Longmans).—Outlines of Sociology: L. F. Ward (Macmillan).—A System of Medicine: edited by Prof. T. Clifford Allbutt, Vol. v. (Macmillan).—Through Unknown Thibet: Captain M. S. Wellby (Unwin).

Pamphlet.—Remarkable Eclipses: W. T. Lynn, 3rd edition (Stanford).

Serials.—Psychological Review Monograph Supplements, Vol. 2, No. 3 (Macmillan).—Longman's Magazine, June (Longmans).—Sunday Magazine, June (Isbister).—Good Words, June (Isbister).—Chambers's Journal, June (Chambers).—Publications of the British Fire Prevention Committee, Nos. 1 to 7 (1 Waterloo Place).—Humanitarian, June (Hutchinson).—Sitzungsberichte der Physikalisch-Medicinischen Societät in Erlangen, 29 Heft, 1897 (Erlangen).—Natural Science, June (Dent).—Century Magazine, June (Macmillan).—Notes from the Leyden Museum, July and August, 1897 (Leiden, Brill).—National Geographic Magazine, May (Washington).

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